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Analysis of Fish Value Chain: The Case of Gilgel Gibe Dam I Reservoir, Southwest of Ethiopia

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Abstract
The study was undertaken with the objectives of mapping fish value chain and identifies the major actors and analyzing the determinants of value addition of fish in Gilgel Gibe dam I reservoir Southwest of Ethiopia. Out of the total 510 individual fishermen on this reservoir, 128 individuals were selected using a three stage sampling procedure which includes both purposive and simple random sampling methods. Data were collected using interview schedule and analyzed using descriptive statistics and binary logit models. The result of value chain analysis indicated that the direct fish value chain actors in this study area are fishermen, local collectors, fishery cooperatives, whole sellers, retailer and restaurants and hotels while the major enablers are Woreda office of Agriculture and Administrative, NGO's, Bureau of Agriculture, financial institutions, Jimma research center and University and the binary logit model indicated that the value addition of fish were significantly affected by education level, fishing equipment, access to extension service; market information; competitive market agents and credit service. The policy implication is that the fishermen should be educated through extension service, providing modern input and technologies, strengthening of market extension and linking them with financial service provider and empowering fishery cooperatives improves the fishery value addition development; thus income of individual fishermen could be enhanced.
Keywords: Binary logit model, Fish Value chain, Fish Value Chain Map, Gilgel Gibe dam I reservoir

I. INTRODUCTION

Many millions of people around the world find a source of income and livelihood in the fisheries and aquaculture sector (FAOUN, 2014). Fish is also a major source of livelihoods and income, particularly in developing countries. It is estimated that more than 158 million people in the world depend directly on fish-related activities (fishing, fish farming, processing and trading). More than 90 percent of them are small-scale operators living in developing countries (HLPE, 2014). The sector contributes to development and growth in many countries; playing an important role for food security and nutrition, poverty reduction, employment and trade, provided livelihoods and income (Roger, 2013), and other social benefits and serves as an important source of diet for over one billion people in the world (Manasi *et al*., 2009).

The importance of fisheries to the Ethiopian economy until 50 years ago was insignificant due to abundant land-based resources and a sparse population density. But, from the 1940s and 50s the rapid population growth, which resulted in a shortage of cultivable land and depletion of land resources forced the people to look for other occupations and sources of food from water resources at a subsistence level (Alayu, 2012). Also; the rapidly growing demand for fish throughout the country's towns and cities dwellers contributed to the start of commercial fishing and needs its supply to the market through value chain as a new practice in the country (Assefa, 2013).

The value chain in fisheries is distinguished from traditional industry and service in one major aspect which is that the raw material comes from renewable resources. As the name suggests, value-chains add incremental value to the product in the nodes of a chain either by value addition or value creation. This value is then realized from higher prices and/or the development of new (niche) or expanded markets (De Silva, 2011). The fishery value chain approach can be useful in developing the strategies to address the main factors which constrain the development and management of the fisheries sector in the country (Aaron, 2014).

Fish production and marketing is an important source of income and employment opportunity in this study area. Even though there were no reliable data about the fish resource of Gilgel Gibe dam I reservoir; being the potential of production and marketing of fish the area have access to both domestic and terminal markets for the future. Fish production in this reservoir has been started since the dam starts its operation. The potential contribution of these reservoir fisheries is to achieve the regional development objectives includes nutrition and food security, source of sustainable income and create employment opportunity, alleviation of poverty, in reduction of imported fish products and economic growth for private sector including hotels and restaurants. It could also; offer several opportunities to support the society especially to the youth and women surrounding the reservoir. However, people living around this reservoir have engaged in producing fish as income generating activity till the reservoir was constructed; they were not benefited as expected from this product. Because their benefit could be attributed to the fact that they were engaged in traditional way of harvesting with less

production and poor post-harvest management practice and selling with lower prices. In addition; both buyers and sellers in the study areas usually do not play collective roles towards one another and there were no further fish processing activities rather preliminary processing activities at fishermen level. Hence, Problems in the fish value chain hinder the potential gains that could have been attained from the existing opportunities. This, therefore, calls for a strategy to scale up the production as well as further processing and value addition of fish in this study area is very important to meet the excess demand and make small scale producers beneficiary from the fishery market opportunity. Therefore, this study was conducted with an objective of mapping fish value chain and identify the major actors and to analyze the determinants of value addition on fish at individual fishermen level in Gilgel gibe dam I reservoir southwest Ethiopia, to fill the knowledge and reducing the information gap on the subject matter by contributing to work better understanding on improved strategies for reorienting value chain system for the benefit of small farmer development and traders in the study area.

2. MATERIALS AND METHODS

2.1. Location of the Study Area

Gilgel gibe dam I reservoir is located in Oromia regional state, Jimma Zone about 260 km south west of Addis Ababa and 60 km north-east of Jimma town. It is enclosed with four Woredas namely Sekoru, Omo Nada, Kersa and Tiro Afeta; with the area coverage of the reservoir 62 square kilometers (Gashaw and Mathias, 2014) and it has been operational since February 2004 **(**CEE Bank watches Network, 2008**)**. Astronomically it is found within 7º3' to 8º3' and 36º7'to 37º6' with an average altitude of 1,650 m.a.s.l, annual rainfall is about 1,479 mm (Bahiru, 2010) and it is the reservoir of Gilgel Gibe Hydroelectric dam I. With-in these four woredas there are Eight beneficiary rural kebele's and about 12 small scale fish producer cooperatives were organized from these kebeles and engaged on fish production and marketing. The total beneficiaries (fishermen) are about 510 individuals. Its location is shown in Fig. 1 as follows.

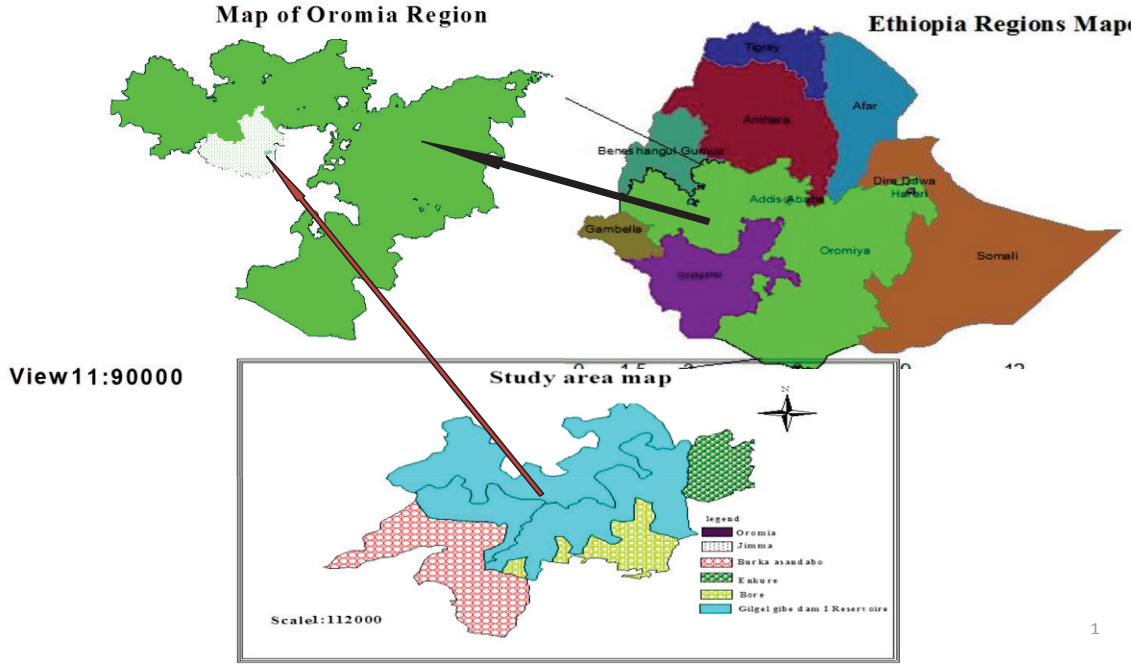

FIG.1: MAP OF THE STUDY AREA. SOURCE: SELF-SKETCHED.

2.2. Sampling and Data Collection

Type, Source and Methods of Data Collection: The primary data required for this study was collected from the key informants selected in this study area and the secondary data were collected from literature review and from related government organizations. The formal survey was done using structured questionnaire and checklist prepared for each group (i.e. fish producers, fishery cooperatives, local collector, wholesalers, retailers, and restaurants/hotels). The group included all individuals participating in the value chain of fish in the study area. The informal surveys were done using Rapid Market Appraisal (RMA) technique using checklists.

Sampling Technique, Procedure and Size: A three stage sampling procedure has been applied to select the sample respondents. In the first stage, two weredas namely Omo Nada and Sokoru were purposively selected

based on their fish production potential. In the second stage, one kebele from Omo Nada (Burka Assendabo) and two kebeles from Sokoru (Hunkure and Bore) were purposively selected based on their intensity of fishing activities and in the third stage a total of 128 individuals were selected using proportionate simple random sampling methods from a total of 189 fish producer of the three selected kebeles. Finally; 4 local collectors, 4 fishery cooperatives, 3 wholesalers, 4 retailers, 4 restaurant and hotels and 10 fish consumer individual were purposively selected after specifying their name based on the information collected from the target respondents that for whom they sell their fish. The sample size determination was resolved by means of Yamane (1967) sampling formula with 95% confidence level. $n = \frac{N}{1+N(e^2)}$ Where: - **n** is sample size, **N** is population and ***e is*** with the desired level of precision which is 0.05.

2.3. Methods of Data Analysis

Both descriptive statistics and econometric analysis were used for data analysis. For both of the methods statistical package for social science (SPSS version 20) and statistical software (STATA version 12) were employed.

Value chain analysis: As products move successively through the various stages, transactions take place between multiple chain actors, money and information were exchanged and value was progressively added. The analysis of fish value chains highlights the need for enterprise development, enhancement of product quality, and quantitative measurement of value addition along the chain, promotion of coordinated linkages among producers and improvement of the competitive position of individual enterprises in the marketplace. Moreover, individual fishermen may feed into numerous chains; hence, which chain (or chains) was/were targeted depends largely on the point of entry for the research inquiries (Kaplinsky and Morris, 2001).

The value chain in the fisheries sector can be defined as the movement of fish from the landing beach, through the supply chain, to the final consumer taking into the consideration the whole range of activities and the subsequent value addition undertaken by different stakeholders at various levels of the chain in lieu of a profit accruing to them from their operations (A. J. Kulmiyei, 2010). It may be long or short for a particular commodity depending on the qualities of products, size and nature of consumers and producers and the prevailing social and physical environment (Ferdous et al., 2012). Value chains for capture and culture fisheries differ from fish to fish and from country to country and frequently within regions (De Silva, 2011).Value chain describe a high-level model of how fishery businesses receive raw materials as input (captures and culture fisheries) and add value to the raw materials through various processes and sell finished products to customers. Moreover, fishery value chain can be defined as interlinked value-adding activities that convert inputs into outputs which in turn add to the bottom line and help to create competitive advantage. Therefore, an attempt was made to analyze the current domestic marketing channels and key actors involved in fish value chain in this study area.

Mapping of the value chain: It is to understand the characteristics of the chain actors and the relationships among them, including the study of all actors in the chain, of the flow of fish product through the chain and its destination and volumes of domestic sales. This information can be obtained by conducting surveys and interviews as well as by collecting secondary data from various sources. The main aspect of fish value chain analysis was done by applying some quantitative and qualitative analysis. First, an initial map was drawn which depicts the structure and flow of the chain in logical clusters. This exercise was carried out in qualitative and quantitative terms through presenting the various actors of the chain, their linkages and all operations of the chain from pre-production (supply of inputs) to consumption.

Econometric analysis: Several studies indicate that econometric models have the power to generate essential information on causal relationship between dependent and independent variables. In reality the data especially the survey data, often have limitations and may not even include all the necessary variables, which could impose restrictions on the methods to be applied. An econometric model consists of a dependent variable and independent variables, also called explanatory variable and an error terms, or to be more precise stochastic disturbance terms, which stand for unobservable random variables not explicitly included in the model (Gujarati, 1998).

Regression models for categorical dependent variables : In categorical dependent variable models, the left-hand side (LHS) variable or dependent variable is neither interval nor ratio, but rather categorical. The level of measurement and data generation process (DGP) of a dependent variable determine a proper model for data analysis. Binary responses (0 or 1) are modeled with binary logit and probit regressions. In general, logit models reach convergence fairly well. For this study by using the logistic regression the probability of a result being in one of the two response groups (binary response) is modeled as a function of the level of explanatory variables. Thus, the probability of whether or not the fishermen do fish value addition activity may be modeled as a function of the level of one or more independent variables. Hence; for this study, the response variable is 1 when the fishermen do fish value addition and 0 otherwise. Therefore, to analyze the determinants of value addition of fish at fishermen level; binary logit model were employed.

The binary logit model function used in this model was:

$$\text{Logit(P)} = \ln\left(\frac{P}{1-P}\right) = \beta 0 + \beta 1 xi + \epsilon$$

$$\left\{\begin{array}{l} y = 1 \text{ if } y > 0 \\ 0 \text{ if } y \leq 0 \end{array}\right\}$$

Where: Logit (P) = is the log odds of the dependent variable = the log of the odds ratio
β_1 = the slope coefficient, measures the change in L for a unit change in x,
β_0 = the intercept value of the log odds
P = the probability of value addition,
(1− P) = the probability of not adding value on fish
ε = error/disturbance term.

$$\textbf{Logit (P)} = \beta + \beta 1\text{Age} + \beta 2\text{Edu} + \beta 3\text{Fexp} + \beta 4\text{Inc} + \beta 5\text{AMktA} + \beta 6\text{Exs} + \beta 7\text{Pric} + \beta 8\text{Dmkt} + \beta 9\text{AcRod} + \beta 10\text{AcMktInf} + \beta 11\text{AC} + \beta 12\text{Aequp} + \epsilon$$

3. RESULTS AND DISCUSSION

3.1. Descriptive Results

Demographic and socio-economic characteristics of sample fish producers: A total of 128 individual respondents were randomly selected and totally all the respondents were male, an average age of individual respondent's was 26 which indicate that most of the targeted fish producers respondents in this study area were found in the young age group. The average fishing experience of targeted respondents was 4.5 years with the minimum and maximum of 1 and 10 years respectively. With regards to educational status 22.7%, 26.6% 29.7 % 14.1 % and 7 % of the respondents was literate, read and write, grade 1- 4, grade 5-8 and grade 9-12 and above respectively. In average the marital status of the total sample respondents was found to be 46.9% and 53.1% are married and unmarried respectively. With regarding to small scale fishery cooperative 41.4 % of the respondent individual fish producer farmers were members of fishery cooperatives and 58.6 % were non- member in this study area. It is indicated in table 1 as follows.

TABLE 1: DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS OF FISHERMEN (N = 128)

Variables	Item	Categorical Variables		Continuous Variables		
		Frequency	%	Average	Min	Max
Sex	Male	128	100			
	Illiterate	29	22.7			
Education	Read and write	34	26.6			
	Grade (1-4)	38	29.7			
	Grade (5-8)	18	14.1			
	Grade (9-12) and above	9	7			
Marital Status	Married	60	46.9			
	Unmarried	68	53.1			
Cooperative member ship	Yes	53	41.4			
Non-Fishing income	Yes	76	59.4			
Age	No of Year			26	16	45
Family Size	No			3	1	10
Fishing Experience	No of Year			4.5	1	10

Source: Own computation from survey result, 2017.

Fish production overview: In this reservoir there are three fish species such as: Tillapia, Barbus and Cat fish. The most productive and preferred species of fish in this reservoir is Tillapia because of its availability and more sweet and can be easily filleted than the other species. The fishing equipment that the producers used were: Drift-nets, fishing boats, locally made boat ("*Bidiru*") which is made of local materials, fishing hooks**;** filleting blades were the main fish production equipment in the study area. The majority of the sample producers used the fishing equipment which was previously offered by support provider (supporting agents such as NGO: World vision Ethiopia Omo Nada branch). The equipment's are timber made boat, fishing net, freezer and motorized boat, additionally some of the individual fish producer uses locally constructed boat. Fish seed is applied on the reservoir by Oromia Bureau of Agriculture in collaboration with Ziway fishery research center.

Fishing frequency: From the total of target respondents the average fishing day's frequencies per week of individual fish producer were 5 days per week with the minimum and maximum of 3 and 7 days per week respectively. It is discussed in table 2 as follows.

TABLE 2: FISHING FREQUENCY OF THE RESPONDENT FISHERMEN PER WEEK

Production Days/week	Frequency	Percent	Min	Max	Mean
3	13	10.2			
4	33	25.8			
5	41	32.0	3	7	4.97
6	27	21.1			
7	14	10.9			
Total	128	100.0			

Source: own survey result, 2017

Fish Production, selling and Consumption overview: Fish production in Gilgel Gibe Dam I reservoir takes place all year round from the start of the dam constructed; however the peak period when the best harvesting is between February and June. Based on the survey result the daily average fish production of an individual fish producer was 5.92kg/person and the average annual volume of production was 33,124kg/year and 163,761kg/year for whole and semi-processed (filleted) fish respectively. Some fishermen produces a combination of whole and filleted fish and very few fishermen produce only one of the two i.e. whole or filleted fish only. Accordingly the total volume of fish produced in the study area in the year(2017) was estimated as 196,885kg/year which is16.4% were used by fishermen for home consumption, 4.5% were lost in different ways and the remaining 79.13% was supplied to the market through different market channels. It is briefly indicated in table 3 as follows.

TABLE 3: ANNUAL PRODUCTION, CONSUMPTION, LOSS AND SALE OF FISH IN THE STUDY AREA

Type of fish produced	**Av.daily prod**/person	**Av. Annual** Production	Annual consumption	Average Sale	Average loss	Av.Sale price (ETB/kg)	
						Fasting Season	Non-fasting season
Whole fish	0.995	33,124				9.36	8.78
Semi-processed	4.92	163,761				26.31	15.89
Total	5.92	196,885	32,282	155,799	8797		

Source: Own computation from survey result, 2017

There were high postharvest losses due to improper harvesting, poor post-harvest handling, and lack of fish storage facility and due to the nature of the product being easily deteriorate. According to the survey result shown on table 7 above because of those reasons 4.5 % of fish produced can be deteriorating per year before it reaches to market. An average fish price in 2017 was 9.36 and 26.31 ETB/Kg in Christian fasting season and 8.78 Birr and 15.89 ETB/Kg in non-fasting season for whole fish and semi-processed/filleted fish respectively.

Fish Processing and post-harvest handling: Fish which is produced in the study area was supplied to the market either as gutted whole fish or filleted fish. As the survey result indicated there were no further fish processing activity undertaken but mostly the fish producer accomplish only the preliminary fish processing activity such as: washing, filleting, gutting, cleaning and sorting and very few of them add some processing and preservation activity such as plastic packing and storage facility. Once the fish is caught they do only for preliminary processing (i.e. washing, gutting, cleaning) and taken direct to the market for selling without any further processing and value addition. The situation therefore impact on the next actors in the chain to find ways of preventing the fish from going bad because there was no preservation for their fish such as smoking, icing and sun drying… etc. because these processes and preservation methods needs knowledge and understanding of fish handling and post-harvest management. Therefore; the cumulative result of this study shows they do only for preliminary fish processing. The following table 4 shows the existing ways of fish processing and value addition in the study area.

TABLE 4: THE EXISTING WAYS OF FISH PROCESSING AND VALUE ADDITION IN THE STUDY AREA

Type of processing and value addition	Respondent (N=128)		Remark
	Frequency	%	
Washing	105	82	These are the preliminary or primary processing stage
Cleaning	103	80.5	
Gutting	59	46	
Fileting	52	41	
Sorting	58	45	
Grading	55	43	Secondary Processing where value addition in fishery is accomplished
Plastic Packing	8	6	
Smoking	0	0	
Icing	0	0	
Salting	12	9.4	
Sun drying	0	0	
Storage and Refrigeration	11	8.6	

Source: Own computation from survey result, 2017.

3.2. Value chain mapping

According to McCormick and Schmitz (2001), value chain mapping enables to visualize the flow of the product from conception to end consumer through various actors. It also helps to identify the different actors involved in the fish value chain, and to understand their roles and linkages. The value chain isn't necessarily straight it has vertical relationships as the product moves through different processing stages and it has various horizontal relationships as the product passes to multiple markets (Hempel, 2010). An important concept is that no matter its direction, all decisions made at one step have consequences thereafter. Value chains can be mapped and analyzed further using a value chain analysis framework. Consequently, the current value chain map of fish in study area is depicted in Fig. 2 below.

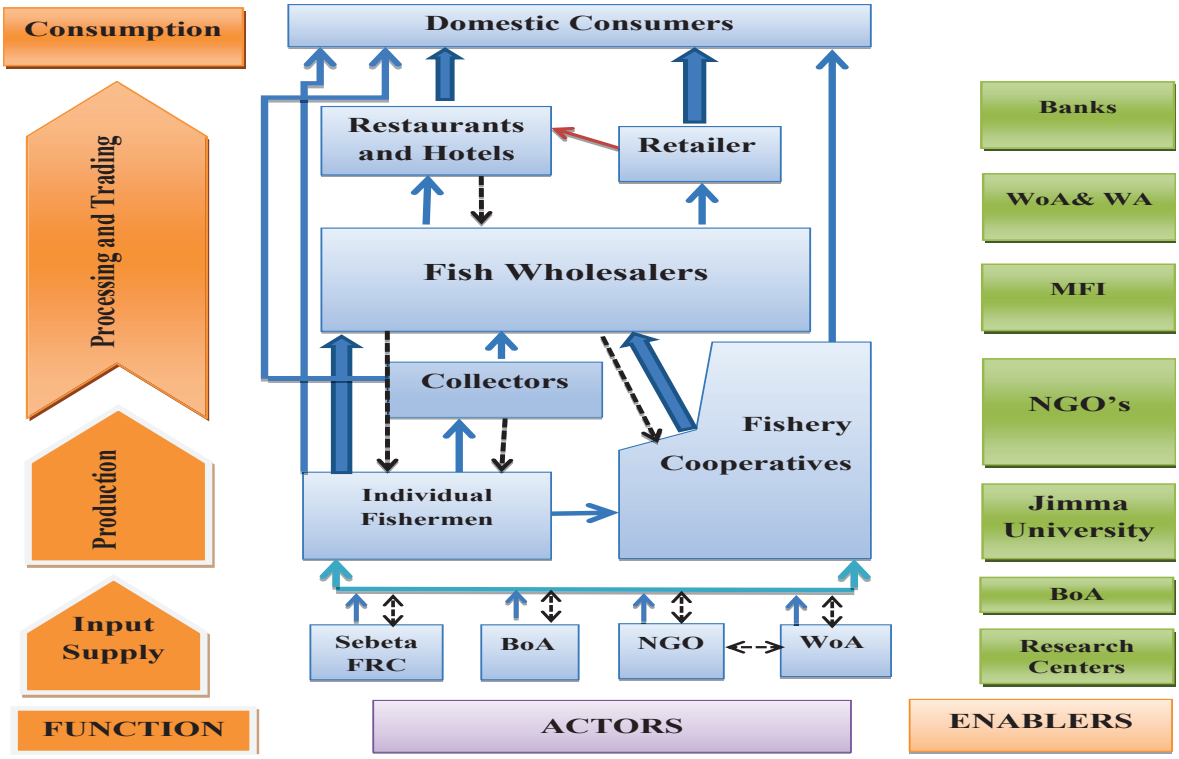

FIG.2: VALUE CHAIN MAP OF GILGEL GIBE DAM I RESERVOIR'S FISH

Key:

Represent Flow of fish products

Represents two way flow of information and technology

One way flow of information

Represents much flow of fish product through the chain

Source: Own sketch from survey result, 2017.

Actors and Their Role in Fish Value Chain

There are several actors in fish value chains in the study area who engaged in various activities from fishing up to retailing. These actors have defined roles specific to the activities they perform and/or services they provide within the chains. The value chain map highlighted the involvement of diverse actors who are participated directly or indirectly in the value chain. According to KIT *et al.* (2006), the direct actors are those involved in commercial activities in the chain (producers, traders, consumers) and indirect actors are those that provide financial or non-financial support services such as input suppliers, credit agencies, business service providers, government, NGOs, researchers and extension agents.

In the case of this study area fisheries sector, however, a full value chain analysis cannot be done due to the fact that fish marketing is not well developed and that producers and customers in most cases deal with each other without involving other intermediaries. Despite this limitation an attempt had been made to analyze the current fish marketing channels and key actors involved in these chains and other relevant issues. Based on their roles and responsibilities the actors participating in this chain are discussed as follows.

Primary actors: The primary actors in fish value chain in this study area were input supplier, individual fish producers', fish producer cooperatives, traders and consumers. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor and some actors perform more than one role.

Input supplier: At this stage of the value chain, there are many actors who are involved directly or indirectly in fish input supply in the study area. Currently the Woreda Office of Agriculture, Sebeta research center and NGO's such as world vision Ethiopia are the main fish input supplier. The World Vision Ethiopia is also supporting the fishermen on the reservoir in funding for provision of training and fishing equipment purchasing. All these actors are responsible to supply fish seeds and fishing equipment which are essential inputs at the production stage.

Producers/Fishermen: Fishermen are people who earn their living by exploiting fish resources. Individual fish producers are the first link and major actors who perform the work of fish production and supply to the market in this study area's fish value chain. Their major functions in this value chain are mainly processing of fish at preliminary stage such as: fish harvesting, washing, cleaning, gutting, filleting and transport to their next customer. Their mode of transportation is using head load and "bajaj" motors. As the survey result indicated they are responsible for the supply of 155,799kg of fish to the market in this study year.

Local Fish Collectors: These are traders in assembly markets who collect fish from individual fisher at their production/landing area for the purpose of reselling. As indicated from this study, they use their financial resources and their local knowledge to handle and transport their fish to their customer area. They play an important role in fish value chain in linking producer with traders and responsible for the trading of 12,152kg of fish from production area to wholesaler, retailers and consumer markets in the study areas. The other function of these actors is doing for time and place utility. Their role is buying and assembling, sorting, transporting and selling to the next actors in this value chain.

Wholesalers: In case of this study area most of fish whole sellers are found 5 km far from the reservoir in Assendabo village and they are who buys whole and filleted fish from the fisher men, local collector and fish producer cooperatives. They are the main assembly centers for fish in their respective surrounding areas and play an important role in linking fish producer with the other actors in the chain and doing for value addition as time and place utility. As this study indicated they are responsible for trading of 81,482kg of fish. They were involved in collecting a large volume of fish from their supplier and supply to fish retailers, fish traders who came from abroad (from Addis Ababa, Wolkite and Wolisso) and restaurants and hotels at Jimma town. They can store fish usually for a maximum of three days and perform rewashing, sorting, grading, plastic packing, refrigeration and transporting to where their customer is located. Their mode of transportation is mainly using bajaj motor to collect from their supplier and passenger minibus to transport to Jimma town. They have better storage facility, transport and communication access than other actors in the chain.

Retailers: They are key actors in this value chain who link between producers and consumers. Mostly they buy from wholesalers and sell to consumers and responsible for 24,445kg of fish. As indicated from this survey their role in this study area is that; they clean and stores, prepare packages, provides fish and their products directly to the final consumer and sometimes they supply to restaurant and hotels at Jimma town when there is shortage of fish supply. Consumers usually buy the product from retailers as they offer according to requirement and their purchasing power.

Primary fishery Cooperatives: Fishery cooperatives are one of the fish value chain actors in this study area and have a great role in this value chain. They are the second fish collector from fish producer. Their role in this fish value chain includes buying of fish from the individual producer at their store house; store it in refrigeration, plastic packing and selling for their customer such as for wholesaler and direct consumer. Most of the fishery cooperatives are found in Sekoru Woreda and they have an opportunity to sell their fish to Jimma to Addis Ababa voyagers at their shop since they are at the side of the main road.

Restaurants and hotels: The restaurants and hotels are where the consumers consume value added fish. Once they buy fresh fish from wholesalers; they store in refrigeration, prepare by roasting and pickling (addition of spice and vegetable) and called *"Asa batikilt","Asa Tibsi" and "Asa Kotelete"* to satisfy their customer. They are more responsible for time, place and form utility for their customer. In rare case when there was shortage of supply of fish from their regular customer (whole seller) they collect fish from retailers. Since they do more value addition on their fish and incur additional costs during processing and preparation they gain more profit margin.

Fish consumers: Consumers are those who purchasing the fish products from different sources of fish supplier for home consumption purpose. They consume fish as a substitute protein food especially at Christian fasting season the preference of consumer to fish is highly increases. They prefer fresh, quality and plastic packed fish for consumption. They particularly buy from the retailers and restaurants and hotels at the markets often in small quantities. Those who live near the reservoir and passengers who travels Jimma to Addis Ababa also buy from the fishermen themselves at landing place.

Supporting actors: Supporting actors are those who provide supportive services for fish producers on this reservoir including supplying fish seed and other inputs, training and extension, different information, financial and credit services and legality concern services. According to Martin *et al*. (2007), access to information or knowledge, technology and finance determines the state of success of value chain actors. Bureau of Agriculture, Sebeta Fishery research institute, Gilgel gibe hydroelectric power station, rural micro finances and Jimma University are the main supporting actors who play a central role in the provision services in fish value chain of this study area. Different NGO's who are performing their work on natural resource conservation henceforth for the sustainability of the reservoir provides economic support to fishermen.

3.3. Econometric Results

Determinants of fish value addition: Twelve variables were hypothesized to explain the determinants of fish value addition of individual fish producer in the study area; such as Age, Education level, fishing experience, fishing equipment, additional means of income other than fishing, access to competitive marketing agents, access to extension service, selling price of fish in 2017, distance from the nearest market center, access to all weather road, access to market information and access to credit service. Out of these six of the variables were found to be significant, while the remaining six were less powerful in explaining the determinants of fish producer's processing and value addition on their fish.

The maximum likelihood estimates of the logistic regression model show that education level, fishing equipment, accessing competitive marketing agents, Extension service, access to market information, and Access to credit service were important factors influencing individual fishermen processing and value addition on their fish in the study area. The Pseudo R^2 shows approximately 0.67. Indicating that variations in probabilities of processing and value addition of fish by individual fish producer in the sample surveyed was explained by about 67 percent of the logistic model. The following table 5 shows the logit model results of this study.

TABLE 5: MAXIMUM LIKELIHOOD ESTIMATES OF LOGIT MODEL AND THE EFFECTS OF EXPLANATORY VARIABLES ON THE PROBABILITY OF FISH VALUE ADDITION

Variables	Coefficient	Odds ratio	Std.Err.	Signf. level
Age	.032	1.033	.086	0.711
Education Level	.704	2.021	.395	0.075*
Fishing Experience	.041	1.042	.231	0.860
Fishing and processing Equipment	4.067	58.379	1.069	0.000***
Means of income other than fishing	.736	2.088	.924	0.425
Access to Competitive Market Agent	2.938	18.870	1.113	0.008**
Extension Service	3.822	45.677	1.213	0.002**
Price of Fish in 2017	.179	1.196	.242	0.458
Distance to the nearest Market	-.398	1.489	.394	0.312
Access to all Weather Road	.488	1.628	.890	0.584
Access to Market Information	1.726	.178	.888	0.052*
Access to credit	1.802	.165	.967	0.062*
N		128		
LR chi2(12)		114.87		
Prob> chi^2		0.0000		
Pseudo R^2		0.67		
Log likelihood		-28.63		

***, ** and * represent level of significant at 1%, 5% and 10% respectively

Source: Computed from the field survey data, 2017.

Education Level was found to be an important variable in value addition of individual fish producer on their

fish and affects positively and significant at 10% probability level. The odds ratio shows the probability of value addition of fish is found to be increased by a factor of 2.021 when the level of education increases by 10 % of who learnt formal education. Therefore, if individual fish producers' gets formal education and learn more, there is a possibility to apply more fish processing and value addition activity. This is in-line with (Odebiyi et al., 2013) who found that education is an important factor which can determine level of awareness on the value addition in fish.

Fishing and processing Equipment is another factor which is significantly related to the dependent variable and that affects positively and significantly at 1% probability level. The odds ratio shows the probability of fish processing and value addition of an individual fish producer increases by a factor of 58.38 when an individual producers having more fishing equipment increases by 1%. The reason behind this is that an individual fish producer farmers accessing more fish processing and handling equipment's have more opportunity to do more processing and value addition for their fishes; because when the fishermen own more fishing equipment they can further process and do for more value addition on their fish.

Access to Competitive Marketing Agents was also affects the value addition of fish positively and significantly at 5% probability level. The odds ratio shows that whenever accessing of competitive marketing agents for individual fishermen increases by 5%; the probability of processing and value addition on their fish increases by a factor of 0.1779. This means the processing and fish value addition is influenced by participation and accessing competitive marketing agents who can pay more prices for being value added fish products for individual fish producer.

Extension service: It was found to be an important variable in fish processing and value addition and it affected the individual fish producer capacity to value addition on their fish products positively and significant at 5% probability level. The odds ratio shows that accessing extension services increases the probability of value addition of individual fish producers by a factor of 45.677 whenever the fishermen access to extension increases by 5%. This means as the individual fish producer contact to extension service increase the probability to undertake further processing and value addition on their fish increases; because through provision of extension service farmers' knowledge and capacity to apply modern activity can be upgraded.

Access to Market information: It affected the process of value addition of individual fish producer on their fish positively and significantly at 10% significance level. This is the binary logit estimate for a one unit increase in market information; given the other variables in the model are held constant, increases the value addition on the fish by a given factor. The odds ratio shows that if individual fish producers access to market information is increased by 10% probability level; the level of processing and value addition on fish at individual fish producer level increases by a factor of 0.178. This means whenever fishermen try to get market information they collect about the type of product the customers want.

Access to credit service : The results of the logit model show that this variable affects the processing and value addition of individual fish producer on their fish product is positively and significant at 10% probability level. The odds ratio shows that whenever the producers' access to credit service increases by 10% the processing and value addition on their fish product increases by a factor of 0.165.This means accessing credit of individual fish producers increases the capacity to purchase fishing and processing equipment of the fishermen to accomplish further processing and value addition on their fish.

4. CONCLUSION AND RECOMMENDATION

The results of descriptive statistics indicated an individual fish producer data point out that, the average daily fish production per individual producer during the survey year 2017 was 5.92 kg/day and in average fish production per year of the sampled respondents were 196,885kg/year. About 79% of the fish produced were supplied to the market, 16.4% was used for home consumption which is in average about 0.92kg per day per individual fishermen and 4.5 % of fish was lost by deteriorating before it reaches to market. On the other hand most of them were engaged on production of fish as individual basis; only 41.4 % of them were organized under small scale fishery cooperative in this study area.

The analysis of fish value chain revealed that the main value chain actors are input suppliers, fishermen, fish producer cooperatives, local fish collectors, wholesalers, retailers, restaurants and hotels and finally consumers. Currently the woreda office of agriculture, Sebeta fishery research center, Bureau of agriculture, micro financial institution, Jimma University, Jimma research centers and NGO's such as world vision Ethiopia are the main support provider. The value chain supporters or enablers provide facilitation tasks like awareness creation, facilitating joint strategy building and action and the coordination of support. Therefore; based on analysis results mapping of fish value chain were developed.

With regard to econometrics results the determinants of fish value addition were found to be an important element in the study of fish value chain. Twelve variables were hypothesized to explain the determinants of fish value addition of individual fish producer. Finally; the result of binary logit model shows that only six variables such as education level, fishing equipment, access to competitive marketing agents; extension service; market

information and access to credit service were important factors influencing positively and significantly individual fish producers' value addition on their fish in this study area.

Therefore;, to promote fish value addition in a sustainable way some policy implications are suggested to be addressed by stakeholders: effort should be made to strengthen fishermen cooperative and encourage collective action of stakeholders to make the fishermen benefited, Supporting the fishermen in providing a continuous awareness creation and training through extension, facility for access of modern input and fishery technologies, encourage the producer to participate in competitive market and strengthening of market extension (linking fishermen with competitive fish markets, building marketing capacity of fishermen, etc.) and promote the financial service providers and accordingly extension workers should give attention to encourage them. Hence, it improves their skill to further processing and value addition on their fish. Finally, the future research need to be conducted on production and value addition of fish to identify the existing limitation on market need based fish production, further processing and encouraging them for commercial fishing system by using of modern fishing equipment to make the fish producer more benefited.

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REFERENCES

A.J. Kulmiyei (2010), Assessment of the Status of the Artisanal Fisheries in Punt-land through Value Chain Analysis, Prepared for VSF Suisse and UNDP Somalia.

Aaron P., 2014. Value Chain Approaches in Fisheries Planning. Caribbean Network of Fisher folk Organisation (CNFO). Policy Brief No. 4, pp 3.

AlayuY., 2012.Implementation of Eco-hydrology – a trans-disciplinary science for integrated water resources and sustainable development in Ethiopia. Fish production, processing and utilization in the Lake Tana fisheries, *Bahir Dar Fishery and Aquatic Life Research Center.*

Assefa, M. (2013). Assessment of fish products demand in some water bodies of Oromia, Ethiopia: International Journal of Agricultural Science.ISSN: 2167-0447, Vol. 3 (8): 628-632.

Bahiru G., 2010. Environmental impact monitoring for gilgel gibe I dam using an integrated methods of remote sensing and geographic information system (GIS): Addis Ababa University.

CEE Bank watches Network, 2008. The Gilgel Gibe Affair, An analysis of the Gilgel Gibe hydroelectric projects in Ethiopia.

D.A.M. De-Silva, 2011. Value chain of fish and fishery products: origin, functions and application in developed and developing country markets. FAO.

FAOUN, 2014.The State of World Fisheries and Aquaculture. Opportunities and challenges, Rome. Page 10-26.

Ferdous A., Salauddin P., Idris A.M., Madan M.D., 2012. *A Value-chain Analysis of International Fish Trade and Food Security with an Impact Assessment of the Small-scale Sector*

Gashaw T. and Matthias W., 2014. The state of inland fisheries in Ethiopia: a synopsis with updated estimates of potential yield. *Eco-hydrology & Hydrobiology 14 (2014): 200–219.*

Gujarati, Damodar N. 1988, Basic Econometrics. 2nd edition. McGraw-Hill Book Company. New York.

Hempel, E. (2010) 'Value Chain Analysis in the Fisheries Sector in Africa'. Hempel Consult, Norway.

HLPE, 2014.Sustainable fisheries and aquaculture for food security and nutrition.A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2014.

Kaplinsky, R. and M. Morris (2001), A Handbook for Value Chain Research. Brighton, United Kingdom, Institute of Development Studies, University of Sussex.

KIT, FaidaMaLi and IIRR (2006), Chain empowerment: Supporting African farmers to develop markets. Royal Tropical Institute, Amsterdam; Faida Market Link, Arusha; and International Institute of Rural Reconstruction, Nairobi.

Manasi, S., Latha, N. and Raju, K.V. 2009. Fisheries and livelihoods in Tungabhadra Basin, India: Current status and future possibilities. Working Paper 217, the Institute for Social and Economic Change, Bangalore.

Martin G., O. Boualay and B. Julio, 2007.North Houaphanh bamboo value chain analysis. Netherland.

McCormick, D. and Schmitz, H., 2001. *Manual for Value Chain Research on Home workers in the Garment Industry*, Nairobi, Kenya.

Odebiyi O.C, George F.O.A, Odulate D.O., Agbonlahor M.U. and Olaoye O.J., 2013.Value-Chain Analysis for

Coastal Fisheries Development in Nigeria.*Global Journal of Science Frontier Research Agriculture and Veterinary*, Vol 13 Issue 11,version 1.

Roger M., 2013. Fishing for Tomorrow: Managing fisheries for sustainable development.

Yamane, Taro. 1967. Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and Row.